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INVESTOR IN PEOPLE

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NP10 8QQ

REC'D 19 MAY 2003

PCT

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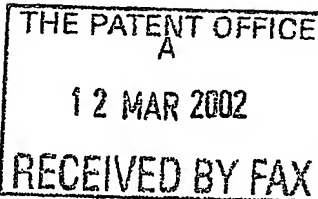
Signed

*J. Evans*

Dated

8 May 2003

Patents Form 1/77

Patents Act 1977  
(Rule 16)12MAR02 E 2830-1/04150  
P01/7700 00-0205759.4

The Patent Office

Cardiff Road  
Newport  
South Wales  
NP10 8QQ**Request for grant of a patent**

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

1. Your reference.

507

2. Patent application number

(The Patent Office will fill in this part)

0205759.4

12 MAR 2002

3. Full name, address and postcode of the or of each applicant (underline all surnames)

SOUTH BANK UNIVERSITY ENTERPRISES LIMITED  
103 BOROUGH ROAD  
LONDON SE1 0AA  
GB

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

76 20792001

4. Title of the invention

IMPROVED BREATHING APPARATUS

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

COHEN, ALAN NICOL  
2 GROVE PLACE  
TATSFIELD  
Nr. WESTERHAM  
KENT  
TN16 2BB

Patents ADP number (if you know it)

696 355 7001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See rule (4)

YES

**Patents Form 1/77**

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description

Claim(s)

Abstract

Drawing(s)

5 /  
1 /  
1 /  
1 only

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10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature

Date 17/03/02

12. Name and daytime telephone number of person to contact in the United Kingdom

A. N. Cohen

01959 577172

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Improved Breathing Apparatus  
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### Improved Breathing Apparatus

This invention relates to equipment for improving the breathing of people such as athletes, singers, people with breathing difficulties and anyone who wants to improve the efficiency of their breathing and endurance.

Athletes, particularly those who take part in middle and long distance events, often train at high altitudes as such high altitude training is known to improve their performance. This improvement is thought to be due to the lower oxygen levels at high altitudes resulting in the body having to become more efficient in its operations.

An acclimated athlete can run at high altitudes because the body can adapt to hypocapnia. This adaptation permits greatly increased ventilation which supplies enough  $O_2$  not only to prevent hypoxia at rest but also provides enough ventilation for strenuous running. This adaptation brings about improved performance at lower altitudes.

However, this adaptive process does not always go smoothly, and acute mountain sickness is a common occurrence. At high altitudes, the alternating stimulation and inhibition of the respiratory centre, first by hypoxia and then by hypocapnia, leads to Cheyne-Stokes respiration, which can become quite pronounced during sleep. In the apneic phase, severe hypoxia may potentially cause the subject to slip from sleep into coma, and sometimes from coma into death.

A voluntary increase in the rate and depth of breathing causes  $CO_2$  to be exhaled at a faster rate than its rate of production by the body's metabolism and results in a drop in the amount of  $CO_2$  in the blood, i.e., results in hypocapnia. If vigorous, rapid breathing is continued for more than a few minutes, increasingly severe hypocapnia will cause cerebral vasoconstriction and unpleasant nervous system symptoms.

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An increased rate and depth of breathing, or hyperpnoea, without an appropriate increase in CO<sub>2</sub> production from metabolism, can be voluntary or caused by a hyperventilation syndrome, anoxic hypoxia, or mechanical ventilation. In all cases, the resultant hypocapnia causes increasingly grave symptoms and is the limiting factor in the amount of excess ventilation that can be achieved. In a number of situations--a good example is the anoxic hypoxia that can occur in high altitude flying--a large increase in ventilation is desirable, and CO<sub>2</sub> enriched air makes this possible.

Various attempts to utilize exhaled air, which is high in CO<sub>2</sub>, have been made as a substitute for providing prepared custom mixes of CO<sub>2</sub> and air. In fact, generations of emergency room physicians have had patients breathe into simple Kraft paper bags to treat hyperventilation that can result from anxiety, fear, or trauma. The paper bag enables a hyperventilating patient to conserve and rebreathe exhaled air.

Variations on the use of paper bags are described in US Patents 3,455,294; 4,508,116 and 4,628,926. Long tubes have been substituted for paper bags and these tubes essentially mimic the effect of paper bags.

U.S. Pat. No. 4,275,722 discloses a respiratory exerciser and rebreathing device which, through a system of valves, provides for an inhalation chamber and an exhalation chamber, with a sliding mechanism to vary the amount of air rebreathed from the exhalation chamber. This device has a complex network of chambers, valves and mechanisms, all designed to route exhaled air through an exhalation chamber and through an inhalation chamber that removes moisture from the exhaled air before inhaling. The exhalation chamber is widely open to ambient air so that fresh air is available at the bottom.

These devices all are designed to combat the effects of breathing problems at high altitude and to overcome physiological difficulties and cannot be used to reproduce the effect of high altitude training.

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Efforts to reproduce the effect of high altitude training at lower altitudes, in order to avoid the expense of travel to, and living in places of high altitudes by training in rooms or chambers with reduced air pressure are expensive to set up and operate and inconvenient to use. Restricting the air flow to an athlete whilst he or she is training is not effective as the volume of air taken with each breath is reduced, which can cause adverse effects on the athlete. Existing equipment which involves the use of re-breathing air so that the air has a lower oxygen content is not practical as this can lead to excessive carbon dioxide build up as detailed above.

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We have now devised a simple effective device for at least partially reproducing the effect of high altitude training which does not suffer from these disadvantages.

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According to the invention there is provided breathing equipment which comprises a mouthpiece through which a user can breath, which mouthpiece is connected to the inlet of a chamber containing a carbon dioxide absorber, the outlet of the chamber being connected to a conduit which is open to the atmosphere in which, in use, the air in said conduit comprises a mixture of air which has been breathed out by the user and air from the atmosphere, which mixture is breathed in by the user.

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The carbon dioxide absorber can be any of the conventionally used carbon dioxide absorbers such as caustic soda pellets, soda lime etc. Preferably the carbon dioxide absorber changes colour as it absorbs carbon dioxide and so it can be seen when it is used up.

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The conduit can be a flexible tube and the length of the conduit depends on the amount of air from the atmosphere it is desired to add to the air to be re-breathed, with the longer the conduit the less fresh air from the atmosphere is added on each breath. For tubes of diameter 1.5 cm to 4 cm tubes of lengths of 50cm to 1.5 metres can be used.

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The air from the atmosphere enters the conduit by diffusion and by the reduction in pressure caused by each in-breath.

- 5 In use, the mouthpiece is attached to the user's face e.g. by being tied on means of straps or an elasticated bands etc. As there is a reduction in oxygen input in use there is preferably an automatic release mechanism so that, in the event of discomfort, air can enter directly into mouthpiece.
- 10 In use the air is breathed out by the user and passes through the carbon dioxide absorber chamber where excess carbon dioxide is absorbed, and then into the conduit, where it mixes with air from the atmosphere. This air is breathed in through the carbon dioxide absorber chamber and the air breathed will consist of air with an oxygen and carbon dioxide content similar to that found at high altitude. By adjustment of the
- 15 length of the conduit and the carbon dioxide absorber chamber contents, the conditions at a selected altitude can be reproduced. This enables a graduated acclimatisation to high altitude conditions to be achieved and is equivalent to high altitude training.
- 20 As well as being used for training athletes, the equipment of the present invention can be used for helping people with weak or defective breathing strengthen their breathing and improve the efficiency of their oxygen metabolism and can be used for overcoming the effects of accidents and disability which result in weakened breathing.
- 25 The invention is illustrated in the accompanying drawing in which there is a mouthpiece (1) connected by tube (2) to a chamber (3) containing soda lime. At the exit of chamber (3) is a flexible tube (4).

- 30 In use, a user straps the mouthpiece over his face so that the user breathes in and out through the mouthpiece (1). When a user breathes out the air breathed out by the user

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passes through the carbon dioxide absorber chamber (3), where excess carbon dioxide is absorbed, and then into the tube (4), where it mixes with air from the atmosphere. This air is then breathed in through the carbon dioxide absorber chamber (3) and the air breathed in will consist of air with an oxygen and carbon dioxide content similar to that found at high altitude. By adjustment of the length of the conduit (4) and the carbon dioxide absorber chamber (3) contents, the conditions at a selected altitude can be reproduced. This enables a graduated acclimatisation to high altitude conditions to be achieved and is equivalent to high altitude training.

- 10 There is release valve (5) which can be actuated to open an air inlet directly into the mouthpiece in case of discomfort or danger, such a valve can be actuated automatically under specified conditions.



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### Claims

1. Breathing equipment which comprises a mouthpiece through which a user can  
breath, which mouthpiece is connected to the inlet of a chamber containing a carbon  
dioxide absorber, the outlet of the chamber being connected to a conduit which is  
open to the atmosphere in which, in use, the air in said conduit comprises a mixture of  
air which has been breathed out by the user and air from the atmosphere, which  
mixture is breathed in by the user.
2. Breathing equipment as claimed in claim 1 in which the carbon dioxide absorber  
comprises caustic soda pellets or soda lime modified so that the absorber changes  
colour as it absorbs carbon dioxide.
3. Breathing equipment as claimed in claim 1 or 2 in which there are attachment means  
to attach the mouthpiece to the face of a user.
4. Breathing equipment as claimed in claim 3 in which the attachment means are  
straps, an elasticated band or the like.
5. Breathing equipment as claimed in any one of claims 1 to 3 in which there is a  
release mechanism which, when actuated, enables air to enter directly into  
mouthpiece.
6. Breathing equipment as hereinbefore described with reference to the drawings.

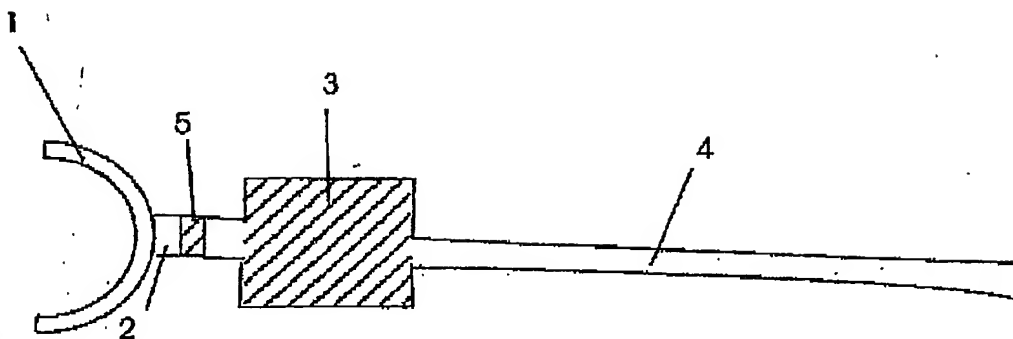
Breathing apparatus  
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### Abstract

Breathing equipment to mimic the training of athletes at high altitude comprises a mouth piece connected to a chamber containing a carbon dioxide absorber which is  
5 connected to the atmosphere by a tube. In use the air breathed out passes through the carbon dioxide absorber into the conduit where it mixes with atmospheric air and the mixture re-breathed.

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